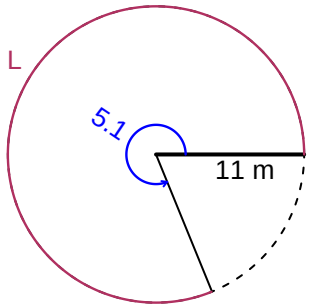
Name: Date:

Trig Final (SLTN v638)

- You should have a calculator (like Desmos) and a unit-circle reference sheet.

Question 1

In the figure below, we see a circle and a central angle that subtends an arc. The angle measure is 5.1 radians. The radius is 11 meters. How long is the arc in meters?

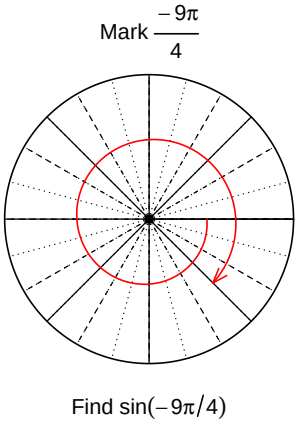


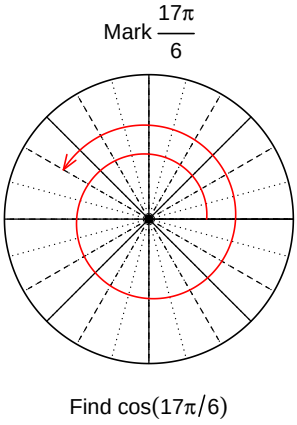
$$\theta = \frac{L}{r} \qquad r = \frac{L}{\theta} \qquad L = r\theta$$

$L = 56.1$ meters.

Question 2

Consider angles $\frac{-9\pi}{4}$ and $\frac{17\pi}{6}$. For each angle, use a spiral with an arrow head to **mark** the angle on a circle below in standard position. Then, find **exact** expressions for $\sin\left(\frac{-9\pi}{4}\right)$ and $\cos\left(\frac{17\pi}{6}\right)$ by using a unit circle (provided separately).





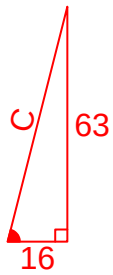
$\sin(-9\pi/4) = \frac{-\sqrt{2}}{2}$

$\cos(17\pi/6) = \frac{-\sqrt{3}}{2}$

Question 3

If $\tan(\theta) = \frac{63}{16}$, and θ is in quadrant III, determine an exact value for $\sin(\theta)$.

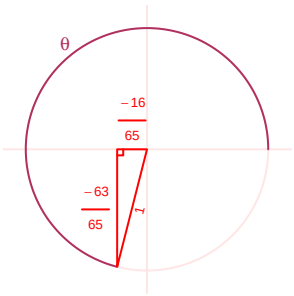
Ignore any negatives and the quadrant, and draw a right triangle (based on SOHCAHTOA) in standard (quadrant I) orientation.



Solve the Pythagorean Equation

$$16^2 + 63^2 = C^2$$
$$C = \sqrt{16^2 + 63^2}$$
$$C = 65$$

Rescale the triangle so the hypotenuse is 1. Reflect the triangle into Quadrant III in a unit circle.



$$\sin(\theta) = \frac{-63}{65}$$

Question 4

A mass-spring system oscillates vertically with an amplitude of 5.78 meters, a frequency of 3.88 Hz, and a midline at $y = -8.04$ meters. At $t = 0$, the mass is at the minimum height. Write an equation to model the height (y in meters) as a function of time (t in seconds).

Any of these equations would get full credit.

$$y = -5.78\cos(2\pi 3.88t) - 8.04$$

or

$$y = -5.78\cos(7.76\pi t) - 8.04$$

or

$$y = -5.78\cos(24.38t) - 8.04$$